AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the Application.

Listing of Claims:

1. **(Previously Presented)** An apparatus for detecting the presence and characteristics of ice on a structure, comprising first transmitter means for transmitting a low frequency signal to the structure; second transmitter means for transmitting a high frequency probe signal to the structure; and receiver means for receiving from the structure a modulated signal produced by the modulation of said high frequency probe signal by said low frequency signal responsive to the presence of ice on the structure.

2. **(Previously Presented)** The apparatus of claim 1, further comprising moving means for moving said low frequency signal relative to said high frequency probe signal; and trigger means for triggering the transmission of said high frequency probe signal after the transmission of said low frequency signal.

3. **(Previously Presented)** A method of detecting the presence and characteristics of ice on a structure, comprising the steps of applying a low frequency signal to the structure; applying a high frequency probe signal to the structure; and receiving from the structure a modulated signal produced by the modulation of said high

frequency probe signal by said low frequency signal responsive to the presence of ice on the structure.

4. **(Previously Presented)** The method of claim 3, further comprising the steps of triggering the transmission of said high frequency probe signal immediately after the transmission of said low frequency signal; moving said low frequency signal about the structure; and monitoring the amplitude of said modulated signal for an increase in modulation.

5. **(Currently Amended)** A method for detecting the presence and characteristics of ice on a structure, comprising the steps of propagating an ultrasonic probe signal in the structure; propagating a low frequency vibration signal in the structure; detecting said ultrasonic probe signal; and analyzing said detected ultrasonic probe signal for ~~interaction between said ultrasonic probe signal and said low frequency vibration signal~~ the modulation of said ultrasonic probe signal by said low frequency vibration signal caused by ice on the structure.

6. **(Cancelled).**

7. **(Currently Amended)** The method of claim ~~6~~ 5, wherein said modulation of said ultrasonic probe signal appears as sideband spectral components of a frequency of said ultrasonic probe signal.

8. **(Previously Presented)** The method of claim 7, wherein said sideband spectral components are associated with the presence of ice on the structure.

9. **(Currently Amended)** The method of claim ~~6~~ 5, wherein said low frequency vibration signal is produced by the operation or the environment of the structure.

10. **(Original)** A method of determining the location and characteristics of defects in or ice on a structure comprising the steps of propagating sequences of an ultrasonic probe signal in a structure; said ultrasonic probe signal having a first frequency; said sequences being propagated at a second repetition frequency; propagating a low frequency vibration signal in said structure, the low frequency vibration signal modulating the ultrasonic probe signal in response to a defect in or ice on the structure; detecting said propagated sequences of the probe signal, and selecting and processing only propagated sequences which are indicative of an area of said structure having a defect or ice.

11. **(Original)** The method of claim 10 wherein said second repetition frequency is sufficiently short to be resolved from the ultrasonic probe signal reflected from the other areas of said structure.

12. **(Original)** The method of claim 11 wherein said second repetition frequency is greater than twice the frequency of said low frequency vibration signal.

13. **(Original)** An apparatus for non-destructive testing of a structure comprising: means for transmitting an ultrasonic signal into said structure; means connected to said structure for receiving said ultrasonic signal; means connected to said structure for generating a low frequency signal in said structure; and control means connected to said transmitting means and to said low frequency generating means for transmitting said ultrasonic signal into said structure at a repetition frequency which is greater than twice the frequency of said low frequency signal; wherein, the low frequency signal modulates the ultrasonic signal in response to a defect in the structure.

14. **(Original)** The apparatus of claim 13 wherein said low frequency signal is generated from the operation or the environment of said structure.

15. **(Currently Amended)** An apparatus for determining the location and characteristics of defects in or ice on a structure, comprising: means for generating a low frequency signal in a structure; means for generating a high frequency signal in the structure; means for receiving a modulated signal from the structure caused by said low frequency signal modulating said high frequency signal in response to the location of a defect in or ice on the structure; and means for analyzing side bands in said received signal for analyzing a defect or ice.

16. **(Original)** The apparatus of claim 15 wherein said means for generating a low frequency signal includes a shaker.

17. **(Original)** The apparatus of claim 15 wherein said means for generating a low frequency signal includes an instrumented hammer.

18. **(Original)** The apparatus of claim 15 wherein said means for generating a low frequency signal includes vibrations present in the structure due to environment and/or working conditions.

19. **(Original)** An apparatus for quantitatively analyzing defects in a structure comprising: means for generating a high frequency signal in a structure; means connected to said high frequency signal generating means for varying the frequency of said high frequency signal over a predetermined frequency range; means for generating a low frequency signal in said structure; means for receiving frequency modulated signals from said structure caused by the low frequency signal modulating the high frequency signal in response to a defect in the structure, said received modulated signals being indicative of a defect in said structure; and means connected to said receiving means for measuring, averaging and normalizing the amplitudes of side bands in said received modulated signals to generate an indication of the size of a defect in the structure.

20. **(Currently Amended)** The apparatus of claim 15 further comprising: means for moving the location of said low frequency generating means on said structure relative to the location of said means for generating said high frequency signal; and control means for triggering said high frequency signal after said low frequency signal is

triggered, whereby the amplitude of said side bands is increased as the location of said low frequency signal generating means is moved towards a defect.

21. **(Original)** An apparatus for locating defects in structures comprising: means for generating a low frequency signal in a structure; means for generating sequences of a short burst high frequency signal in the structure; means for receiving a signal from the structure, said signal being a modulated combination of said low frequency signal and said high frequency signal; means for analyzing selected sequences of said received signal from areas of the structure; whereby a presence of modulation in a selected sequence indicates the presence of a defect in an area of the structure.

22. **(Previously Presented)** The apparatus of claim 1, wherein said second transmitter means includes an ultrasonic transmitter and said receiver means includes an ultrasonic receiver.

23. **(Previously Presented)** The apparatus of claim 22, wherein said structure includes an aircraft wing, said ultrasonic transmitter being embedded in said wing and said ultrasonic receiver being embedded in said wing.

24. **(Previously Presented)** The apparatus of claim 22, wherein said ultrasonic transmitter includes piezoceramic material and said ultrasonic receiver includes piezoceramic material.

25. **(Previously Presented)** The method of claim 4, wherein the modulation of said modulated signal appears as side-band components in the spectrum of said high frequency probe signal, and said step of monitoring the amplitude of said modulated signal includes monitoring the amplitude of said side-band components in the spectrum of said high frequency probe signal.

26. **(Previously Presented)** The method of claim 3, wherein said step of applying said low frequency signal includes applying harmonic vibration to the structure.

27. **(Previously Presented)** The method of claim 26, wherein said step of applying said harmonic vibration is implemented by a shaker.

28. **(Previously Presented)** The method of claim 3, wherein said step of applying said low frequency signal includes applying impact modulation to the structure.

29. **(Previously Presented)** The method of claim 28, wherein said step of applying said impact modulation is implemented by an instrumented hammer.

30. **(Previously Presented)** The method of claim 3, wherein said step of applying said low frequency signal is implemented by structural vibration.

31. **(Previously Presented)** The method of claim 30, wherein said structural vibration is applied by the environment.

32. **(Previously Presented)** The method of claim 30 wherein said structural vibration is applied by working conditions.

33. **(Currently Amended)** A method of analyzing defects in a structure, comprising the steps of : generating a high frequency signal in ~~a~~ the structure; sweeping the frequency of the high frequency signal over a frequency range; generating a low frequency signal in the structure; receiving modulated signals caused by the low frequency signal modulating the high frequency signal in response to a defect in the structure; and analyzing side bands of the modulated signals to analyze the defect.

34. **(Original)** The method of claim 33 wherein the step of analyzing the side bands of the modulated signal comprises measuring, averaging, and normalizing amplitudes of the side bands.

35. **(Original)** The method of claim 34 wherein the size of the defect is derived by dividing the amplitude of the side bands by the product of the amplitude of the high frequency signal and the amplitude of the low frequency signal.

36. **(Cancelled)**.

37. **(Cancelled).**

38. **(Currently Amended)** A method for locating defects in a structure comprising: generating a low frequency signal in a structure; generating sequences of a short burst high frequency signal in the structure; receiving a modulated signal from the structure caused by the low frequency signal modulating the high frequency signal in response to a defect in the structure; and analyzing modulation of sequences of the received signal from areas of the structure to locate a defect in the structure.

39. **(Original)** The apparatus of claim 21 wherein the means for receiving a signal from the structure comprises an array of receivers.

40. **(Currently Amended)** An apparatus for detecting the presence and characteristics of a defect in a structure, comprising first transmitter means for transmitting a low frequency signal to the structure; second ~~transmitting~~ transmitter means for transmitting a high frequency probe signal to the structure; trigger means for triggering the transmission of said high frequency probe signal after the transmission of said low frequency signal; moving means for moving said low frequency signal relative to said high frequency probe signal; and receiver means for receiving from the structure a modulated signal produced by the modulation of said high frequency probe signal by said low frequency signal responsive to the presence of a defect in the structure.

41. **(Previously Presented)** The apparatus of Claim 40, wherein said second transmitter means includes an ultrasonic transmitter and said receiver means includes an ultrasonic receiver.

42. **(Previously Presented)** The apparatus of Claim 41, wherein said structure includes an aircraft wing, said ultrasonic transmitter and said ultrasonic receiver being embedded in said wing.

43. **(Previously Presented)** The apparatus of claim 41, wherein said ultrasonic transmitter includes piezoceramic material and said ultrasonic receiver includes piezoceramic material.

44. **(Previously Presented)** A method of detecting the presence and characteristics of a defect in a structure, comprising the steps of applying a low frequency signal to the structure, said low frequency signal causing self-vibration of the structure; applying a high frequency probe signal to the structure; triggering the transmission of said high frequency probe signal immediately after the transmission of said low frequency signal; moving said low frequency signal about the structure; receiving from the structure a modulated signal produced by the modulation of said high frequency probe signal by said low frequency signal responsive to the presence of a defect in the structure; and monitoring the amplitude of said modulated signal for an increase in modulation.

45. **(Previously Presented)** The method of claim 44, wherein the modulation of said modulated signal appears as side-band components in the spectrum of said high frequency probe signal, and said step of monitoring the amplitude of said modulated

signal includes monitoring the amplitude of side-band components in a spectrum of said high frequency probe signal.

46-49. **(Cancelled).**

50. **(Currently Amended)** The method of claim ~~43~~ 44, wherein ~~said step of applying~~ said low frequency signal is implemented by structural vibration.

51. **(Previously Presented)** The method of claim 50, wherein said structural vibration is applied by the environment.

52. **(Previously Presented)** The method of claim 50, wherein said structural vibration is applied by working conditions.

55-57. **(Cancelled).**